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PASSAGE OF SPECIFIC CHARACTERS FROM ONE GENUS TO ANOTHER. —I find among the *Acrididæ* from the west a case which would seem to go far toward confirming the opinion of Prof. Cope, that often specific characters pass over from one genus to another.

The *Acrolophitus hirtipes* Thos. (*Gryllus hirtipes* Say) forms a very distinct and somewhat peculiar genus; the specific characters are also very distinct and well marked. During my connection with the United States Geological Survey, in charge of Dr. F. V. Hayden I have frequently met with this species in Colorado, northern New Mexico, and Wyoming, but nowhere else in those territories or in northern Utah, Idaho, Montana, Nebraska, Kansas or Dakota have I met with any closely allied species. Recently the Orthoptera collected by Lieut. Wheeler during his Explorations in Arizona have been submitted to me for examination; in that collection I find specimens which, in specific characters including even color, agree exactly with *A. hirtipes*, but differ in two prominent generic characters.

In Acrolophitus the chief generic characters are, an erect, conical vertex (which alone distinguishes it from all other American species of *Oedipodini*); a sharp elevated crest on the posterior lobe of the pronotum; posterior margin of the pronotum acutely angled. The species collected by Lieut. Wheeler has the erect, conical vertex, but the pronotum is without a crest or even a medium carina, and the posterior margin is obtusely rounded, yet the general form, size, etc., even to the hairs on the legs, are the same in both species; the color is exactly the same throughout.—C. THOMAS.

OCCURRENCE OF THE ROCK WREN IN IOWA.—*Salpinctes obsoletus*, not previously found east of the Rocky Mountain region, was observed by the writer last fall in Decatur county, Iowa. It was seen on several occasions, far out on the prairie, running over the ties on the railroad track, retreating when alarmed, into the dense prairie grass.— T. M. T., *Garden Grove, Iowa.*

MICROSCOPY.

APERTURES OF OBJECTIVES.— It is now certain that nothing can be easier than to get more than 82° of rays through a balsam object and immersion objective, and that those accomplished microscopists who maintained the contrary were in error in resting their mathematical argument upon the improved assumption that the conditions under which the law of reduced apertures operated were, and must necessarily be, the same in all objectives as in those which were in their hands. This fallacy in the mathematical argument has been already pointed out in this Journal, as well as by Dr. J. J. Woodward in the "Monthly Microscopical Journal." Now that the doctrine of the limitation of the balsam angle of objectives, plausible and strong in seeming to rest upon well known facts, is removed from the way of progress in the science it was designed to assist, it remains to discuss the means of accomplishing an increase of this angle, and whether such increase may add to the working qualities of the objectives possessing it. Mr. Tolles, who must be admitted to have been the first to claim such increase of angle, believes it to be a valuable addition to the powers of objectives. The following letter from him contains some further discussion of the means of increasing the balsam angle, as well as some claims in regard to his personal relation to the controversy.

Dr. R. H. Ward, *Sir:*—I have read your notice, in the July Number of the Naturalist, of a current discussion as to possible balsam angular aperture of objectives. I am gratified at its evident spirit of fairness; and will ask that, in the same temper, you will give place to some strictures of my own.

The $\frac{1}{10}$ measured in London had, and has, no point of adjustment where with appropriate cover thickness the definition would not be good. Its highest angle, when immersed in water, is about midway of the total adjustment, and at this point corrects for $\frac{1}{75}$ inch cover. All this I will show you any time; also, Dr. J. J. Woodward has verified the same.

There is no secret as to the mode of action and the plan. The theory has been openly declared in every article of mine having the form of reply to Mr. Wenham since his first denial of validity of my first "experiment." Thus, while admitting and declaring the reduction of refraction at the first plane surface, by immersion in a more refractive medium than air, every suggestion on my part has been of *some way of making up for that loss.* You say I appeal to facts not discussing principles. What induced my first experiment was a clear apprehension of law, and the result was confidently asserted beforehand. I have never denied that the air angle of (close to) 180°, after the first refraction, was necessarily reduced to 82° (closely) by crown glass plane surface, and by heavy, flint plane surface to 76° (closely). That is and has been understood, all around; though produced and constantly reiterated as an answer to my claims, not only by Mr. Wenham, but volunteered with much rudeness from another quarter.

You comprehend the case perfectly when you say, "This reasoning assumes only that the extreme ray above the front combination, capable of entering into the image when the objective is worked dry, is the extreme also when adjusted for immersion work." But it would be equally true to say, "the extreme ray above the front" *surface* "is also the extreme ray, etc." In the light of this statement, what is to be understood by my March paper (Monthly Microscopical Journal, 1873) to which you allude as "practically disclaiming this doctrine of rays beyond the extreme rays dry?" Why, I suggest the one sure way of giving entrance from the denser medium into the Front of a larger pencil than before with crown glass, in just so far as the refraction of the Front in such medium approaches the refraction of crown glass in air; and, behold! I am made to disclaim the very thing I have just done and pointed out how. However, from what you have written I know *you* will understand this:—my respondents say at once, "82° impinging on the inner front surface of the front lens will, from crown glass, emerge into the balsam without sensible deviation." Now, suppose we use flint glass; the angle at which total reflection takes place in this, when in contact with air, is not 82° (–), but 76° (about). When a pencil of 82°, however, impinges upon this plane surface of flint, in contact with balsam, it will have positive refraction according to the refractive index of flint glass *in balsam* and therefore while only 82° *in the glass* of the flint front, whether emergent or immergent would have more than that angle in the balsam. This much at least is sure and is decisive of the question. But again, if the material of the *front surface* have a refraction *in balsam* equal to that of crown glass in air, then obviously we *might* have near to 180° in the balsam, while the transmitted pencil immediately above the front surface would remain about the same as the "limiting angle" of crown glass in air, viz.: 82.° This is valid principle and reasoning, but I cannot appeal to facts in this case. The best I have done is 112° in balsam. See "Monthly Microscopical Journal" for June, 1873.

Do not suppose that this is the only way to exceed 82° in balsam practically. The 100° $\frac{1}{5}$ objective of four systems was on quite a different plan. It is, as to plan, described in the "Monthly Microscopical Journal" for March, 1872. There the inner three systems have 130° as a dry objective, the front as applied to those three serving only to admit such a pencil to the dry objective constituted of the inner three. But the $\frac{1}{5}$ tested by Dr. Woodward has, as to the inner three, an angle of 105° in air, and, as they are used, while the front has some, but slight, influence upon the pencil passing through it.

And now, to sum up, referring to my article of March, 1872, "Monthly Microscopical Journal," and diagrams. I will quote Fig. 1 and explanation as *theory*, antecedent to *fact*. The four-system objective being subsequently made and authoritatively re-substantiating the theory. (See "Monthly Microscopical Journal" for June, 1873; paper by Dr. Woodward giving the angle as 100° in balsam.) Quoting again, as to the case of the three systems, same Journal, same page, referring to Fig. 2. "What is intended is to increase the refraction of the convex surface of the front by sharper convexity, or higher refractive material, or *both*, to the extent necessary to make up for the diminution at the plane surface according to the refractive power of the medium" in which the front surface is immersed. Now the results, according to this second case, are well attested for angles considerably above 82° in hard balsam; account of all which will appear in good time for support of my theory! *i. e.*, the universally accepted theory. For balsam of refractive index the same as common crown or plate glass I will, with pleasure, show to you at any time that the angle of the $\frac{1}{10}$ objective, tested in London, is at least 90°; and *that* is the kind of balsam Mr. Wenham has constantly talked of, witness each of his criticisms on my claims. Every time he has alluded to the balsam index, he has declared it practically the same as crown glass. Of course, when hardened to resin, it may have higher refractive index and reduce the angle a little. Hence certain discrepancies as to amount of angle above 82°. For this reason, I have used the semi-cylinder, but that has, and had, another and a superior purpose. As a means of getting the actual angle, and the crucial test to decide this discussion, a much simpler method will serve. Thus, any piece of plate glass, say an inch square or upwards, and perhaps $\frac{1}{10}$ inch thick, or more or less, one or both plane surfaces fine ground, is all that is necessary, only, be it provided, that some part of one edge be a polished or fractured surface tolerably near flat and square. Use this precisely as Dr. Woodward uses his tank, and the angle of the objective for that kind of balsam (like the glass) will be indicated along the ground surface if a little care be taken in adjusting glass to objective. Balsam, glycerine or dense oils will do to connect the objective front and glass plate, for the pencil traversing the plate will be constantly the same for a wide range of "preservative media." This cone can be marked as to its boundaries with a pencil on the ground glass, and measured with a protractor with perfect facility.

Whatever position gentlemen respondent may take now, *pro* or *con*, the end is assured, viz., a practically larger angular aperture for objects in balsam. I hope you will award these comments an insertion. Respectfully yours,

ROBERT B. TOLLES.

40 Hanover Street, Boston, Mass.

P. S.—Since writing the above, the "Monthly Microscopical Journal" for July, containing Mr. Wenham's reply to Dr. Woodward's article, has come to hand. I notice Mr. Wenham recommends the same ground glass plate for test of angle that I describe above, only nothing is said of connecting media. This is excellent! With air between, the cone will, with crown or plate glass, be about 81°, but if water or balsam or any known liquid replaces the air it can be more. It is the test. Some objective will be found in England, I dare say, to go above 82°.—T.

MICROSCOPICAL EXPERIMENTS WITH INSECTS' EYES.—Dr. F. W. Griffin, of the Bristol School of Chemistry, gives in the "World of Science" and in the "Monthly Microscopical Journal," an interesting note on this subject. Any tolerably mounted beetle's eye (transparent) will give some of the desired effects; but for good results the semi-globular set of "lenses" which constitutes the outer part of the compound eye should be very carefully cleaned and flattened without materially altering the form of the individual lenses. This is arranged as a transparent object under a one inch objective, and preferably a "Kelner" eye-piece, when some two thousand lenses or corneules are brought into view at once. By racking the objective up, the focus of these little lenses is found, slightly above their surface, and in the focus of each is seen the image of an object, as for instance a fly on the point of a pen, held between the stage and the mirror. By a little ingenuity a good view can be obtained of a blind-tassel, the profile of a person standing before the window, or even of a landscape outside; though these distant and difficult objects show better by using a ¼ inch objective and a one inch lens as achromatic condenser. A swinging tassel, or a profile cut in brown paper and fastened against the glass, or a person's hand with the fingers in motion, or a watch face with the second hand in motion, are among the curious or grotesque objects that may be seen multiplied hundreds of times in the beetle's eye. When lamplight is used, it must be rendered parallel by the bull's-eye, and for really good effects the concave mirror and one inch achromatic condenser must also be used.

BINOCULARS FOR HIGH POWERS. — Mr. Wenham, finding the various non-stereoscopic binoculars unsatisfactory, and finding it inconvenient to make and mount a reflecting prism which should come sufficiently near the lenses to be efficient with the highest powers, has revived the achromatic refracting prism suggested by him to the Microscopical Society on June 13, 1860, by which the rays from each lateral half of the objective are bent towards the axis of the tube, crossed, and sent to the opposite eye of the observer. The prism, representing really two prisms cemented back to back, is made so small and mounted in so thin a tube that it can be slid down into the mounting of the objective close to the posterior lens.

STRUCTURE OF EUPODISCUS AND ISTHMIA. — Mr. Henry J. Slack has communicated to the Royal Microscopical Society some important researches on this subject, tending to confirm his previous impression that in all diatoms the silicious deposition takes place in spherules of varying dimensions and arrangement. He entirely discards such terms as "areolæ," "cellules," etc., believing that such apparent structures are merely, and always, unresolved groups of variously aggregated spherules. This structure he has demonstrated, and has repeatedly confirmed on Pinnulariæ, but with the old means of investigation he failed on Isthmia and Eupodiscus. With Mr. Wenham's new "Reflex Illuminator," however, these easily fall under the same law, the circular valve of *Eupodiscus*

Argus being composed of radiating bands of minute and closely packed spherules with intervening rows of clusters of larger spherules usually in fours, and *Isthmia enervis* revealing, in the place of its familiar reticulated appearance, an aggregation of minute spherules at different levels but of, as yet, not well determined arrangement. A Beck's $\frac{1}{5}$ objective will reveal this structure, though a $\frac{1}{8}$ is preferable; Powell and Lealand's new pattern (dry front) giving it excellently.

On the other hand, Mr. Samuel Wells of Boston, who has studied *Eupodiscus Argus* without the reflex illuminator, perceives no spherules and explains the usual appearances without them. The outer or convex surface he finds clear and smooth, except that it is irregularly dotted with depressions about $\frac{1}{8000}$inch in diameter and extending nearly through the thickness of the valve. This appearance is verified by the binocular microscope and by sectional views obtained from broken valves, and is not varied by any change of power or illumination. The concave surface, which Moller mounts upwards and which alone was probably studied by Mr. Slack, is nearly smooth, without ridges and probably without granulation. It is covered with irregularly radiating rows of round dots with intervening blank spaces. These dots are about $\frac{1}{20000}$ inch in diameter, and with a $\frac{1}{10}$ or $\frac{1}{20}$ and Prof. H. L. Smith's apparatus for opaque illumination, they appear to be slight depressions with the bottom slightly convex; the four or more which are over each of the depressions on the other side of the valve being naturally brighter than the others, and corresponding to the groups of larger spherules of Mr. Slack.

Mr. Charles Stodder also combats the doctrine that the silicious matter in diatoms is always deposited in the spheroidal form. He still believes that the markings on ordinary diatoms are depressions and not elevations, and that the line of fracture is inclined to run through them instead of between them, and he therefore retains the terms " cellules," " areolæ," etc. His account of *Eupodiscus Argus* is so much like that of Mr. Wells, though published independently, as to suggest the explanation that they have worked at the subject together. He finds two silicious coats, the outer comparatively opaque and marked with large, thin apertures through which could be seen the inner coat with its much finer markings which vary according to focus and illumination from a spherical to a cellular appearance, and from a radiated to an irregular arrangement. Mr. Stodder used Tolles $\frac{1}{10}$ with Prof. Smith's opaque illuminator and Tolles $\frac{1}{18}$ immersion, and he is convinced that some parts of the valves are smooth, transparent, and structureless, without a trace of spherules.

NOTES.

We print in this number the proceedings of the first meeting of the Agassiz Natural History Club, organized by the students of the Anderson School of Natural History at Penikese Island. The school was, notwithstanding the unfinished state of the buildings, and many other temporary drawbacks, resulting from its isolated situations, opened on the 8th of July, fifty students being present. As we go to press the indications are that the need of such a school has been fully demonstrated, and its future success thoroughly assured. The nature of the work already done is such as will tend to make each student an original investigator. A large proportion of the members are teachers. They are learning the art of observing for themselves, gaining an insight into the modes and difficulties of research and obtaining some idea of the vast extent of the field of biology. Even after the short term of ten weeks they will return to their schools and colleges with a new enthusiasm for science-teaching, which will inevitably, if we mistake not, be shown in the other studies they may have to teach.

Though the school, at the time of writing this note, has been running but a fortnight, lectures on surface geology, the embryology of vertebrates and articulates, on physiology, physical geography, on the microscope and its construction, with practical lessons in its use, free hand drawing on the blackboard, zoological and landscape drawing, and daily dredging excursions in the yacht "Sprite," together with instructions in collecting and preserving animals, have been given. The amount of laboratory work done is most satisfactory. Large aquaria are being set up in the temporary laboratory, while the walls for the second dormitory and laboratory are going up.

Certainly the most sanguine friends of the movement have every reason to congratulate the founder and director of the school, with those associated in the work of teaching, on the good prospects of the experiment.